



## Cooperation mechanisms between EU Member States and RES4Less Case Studies

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# Cooperation mechanisms between EU Member States and RES4Less Case Studies

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IEE Project Res4less [www.res4less.eu](http://www.res4less.eu)

# Agenda

- Cooperation mechanisms
- Barriers and critical success factors
- Case study: Offshore wind
- Case study: Biomass
- Case study: Concentrated solar power

# Cooperation mechanisms

- EU commission 20 percent targets in 2020
- Cooperation mechanisms
  - flexibility
  - achieve the targets the most cost efficient way
    - implement the RES where cheapest
  - Statistical transfers
  - Joint project
  - Joint support scheme

## Cooperation mechanisms – statistical transfer

- Ex-post transfer of RES credits
- No prior agreements to assure the sale of the credits
- Ad-hoc means of ‘filling the gaps’
- Does not induce additional RES development
  - does not promote more efficient distribution of RES development
- Final stage transferring of RES certificates for joint projects and joint support schemes

## Cooperation mechanisms – joint project

- Gives MS with lack of sufficient low-cost RES potential (user country) the possibility to develop projects in another MS (host country)
  - Investors supported
    - user country
    - jointly by user and host countries
      - costs are balanced via a compensation scheme
  - Project-to-project basis
  - Special project support framework
    - technology/area specific

## Cooperation mechanisms – joint support scheme

- Broad cooperation of MS on a national level
- MS agree on a common support scheme
- Greatest potential to efficiently utilise RES potential in the involved MS
- Less ambitious option: MS partially coordinate their national support schemes
  - technology/area specific

## Cooperation mechanisms

- Focus in the RES4Less project
  - **Joint project**
  - **Joint support scheme**
- Statistical transfers not addressed, as
  - barriers and the complexities related to statistical transfers are assumed to be limited
  - do not provide more efficient RES development



## Cooperation mechanisms

- Focus in the RES4Less project

- **Joint project**
- **Joint support scheme**



cooperation mechanisms actually implemented might be somewhere in between, as they may contain elements from both types.

- Statistical transfers not addressed, as
  - barriers and the complexities related to statistical transfers are assumed to be limited
  - do not provide more efficient RES development

# Barriers

- Overall precondition for cooperation:
  - Both (all) MS should benefit
    - positive net-benefits are required
- Different political agendas embedded in the support schemes
- Power market effects
- Differences in network regulation
- Costs of non-compliance
- Compensatory challenges
- Post 2020 targets

## Barriers – different support schemes

- Different support schemes
  - Administrative barriers
  - Investor risk
  - Combinations of support schemes
  - Technology-specific support versus general support
- Differences in support level
- Critical success factor:
  - ability/willingness to agree on chosen support scheme
  - coordination with existing support schemes

## Barriers – power market effects

- Inflexibility of the energy system
- Changes in price level and volatility
  - Loss to existing producers
  - Lack of investment incentives
- Less diversified generation mix
  - More vulnerable system
- Critical success factors
  - Ability to agree on a compensation scheme

## Barriers – network regulation

- Network regulation impacts the incentives for networks to facilitate efficient connection of new technologies
- If reinforcement investment costs included in revenue cap the costs will be borne by the network customers
- Crucial success factors
  - ability/willingness to agree on the cost sharing between the cooperating countries
  - ability/willingness to agree on a regulatory set up assuring the installation of RES where it is most effective

## Barriers – cost of non-compliance

- Unknown consequences of non-compliance
  - lack of penalty
    - alternative costs compared to complying = zero
- Critical success factor
  - Ability to establish clear costs of non-compliance

## Barriers – Compensatory challenges I

- Overall precondition for cooperation: Both (all) MS should benefit
- Direct benefits: reduced target compliance costs for the user country
- Indirect benefits:
  - Technology: faster RE technological progress in the host country
  - Power generation efficiency: investments where capacity is needed
  - Employment: positive employment effects in the short run
  - Environmental: binding CO2 target, emission reductions
  - Security of supply: increased interconnection
  - Investor risk: international agreements gives certainty of support
  - National risk of compliance: agreements assures compliance

## Barriers – Compensatory challenges II

- Critical success factors
  - All direct costs and benefits have to be captured in a compensation scheme:
  - Indirect costs and benefits should be considered in the negotiations



## Barriers – Post 2020 target

- No targets for post 2020 specified
  - Potential user countries will focus on the 2020 RES contributions
  - Investments in renewable technologies with 15-25 years lifetime
    - costs from investments large compared to value of RES credits for a single year
      - extreme case: value of credits post 2020 = zero
  - Unwillingness of the host country to engage in cooperation involving their cheapest surplus resources.
- Critical success factor:
  - Settlement of post 2020 targets

## Barriers – Critical success factors

- Incorporate the additional costs of several support mechanism or support levels for different technologies
- Agreement on how to share the costs associated with network regulation
- Market price and investment incentives
- Compensation of changes in market price
- Willingness and ability to adjust to the changes in the energy market
- Incorporate the costs legal agreements and design of agreement
- Settlement of exact non-compliance costs
- All costs and benefits have to be mirrored in a compensation scheme
- Settlement of clear post 2020 targets

# **WIND CASE STUDY OF COOPERATION MECHANISMS**

Henrik Klinge Jacobsen & Lise-Lotte Pade  
Hansen

# Case study for off-shore wind in the Danish North Sea

## Joint project cooperation with tendering of off-shore wind farms

The host country (DK) specifies the tender conditions and negotiate with user country (NL) a transfer price for the RES credits in 2020. The total size of off-shore wind farms are **2GW** corresponding to **8200GWh** in 2020.

## Why this case study?

Off shore wind energy in the North Sea is a very large potential for RES and potential cooperation benefits

Limiting factors are the availability of low cost shallow and close to shore locations without interfering activities

Denmark has a 2020 surplus of medium cost offshore wind potential that is available for cooperation:

- ❑ wind farms have good wind conditions
- ❑ relatively shallow area
- ❑ transmission grid can absorb generation
- ❑ planning is already there

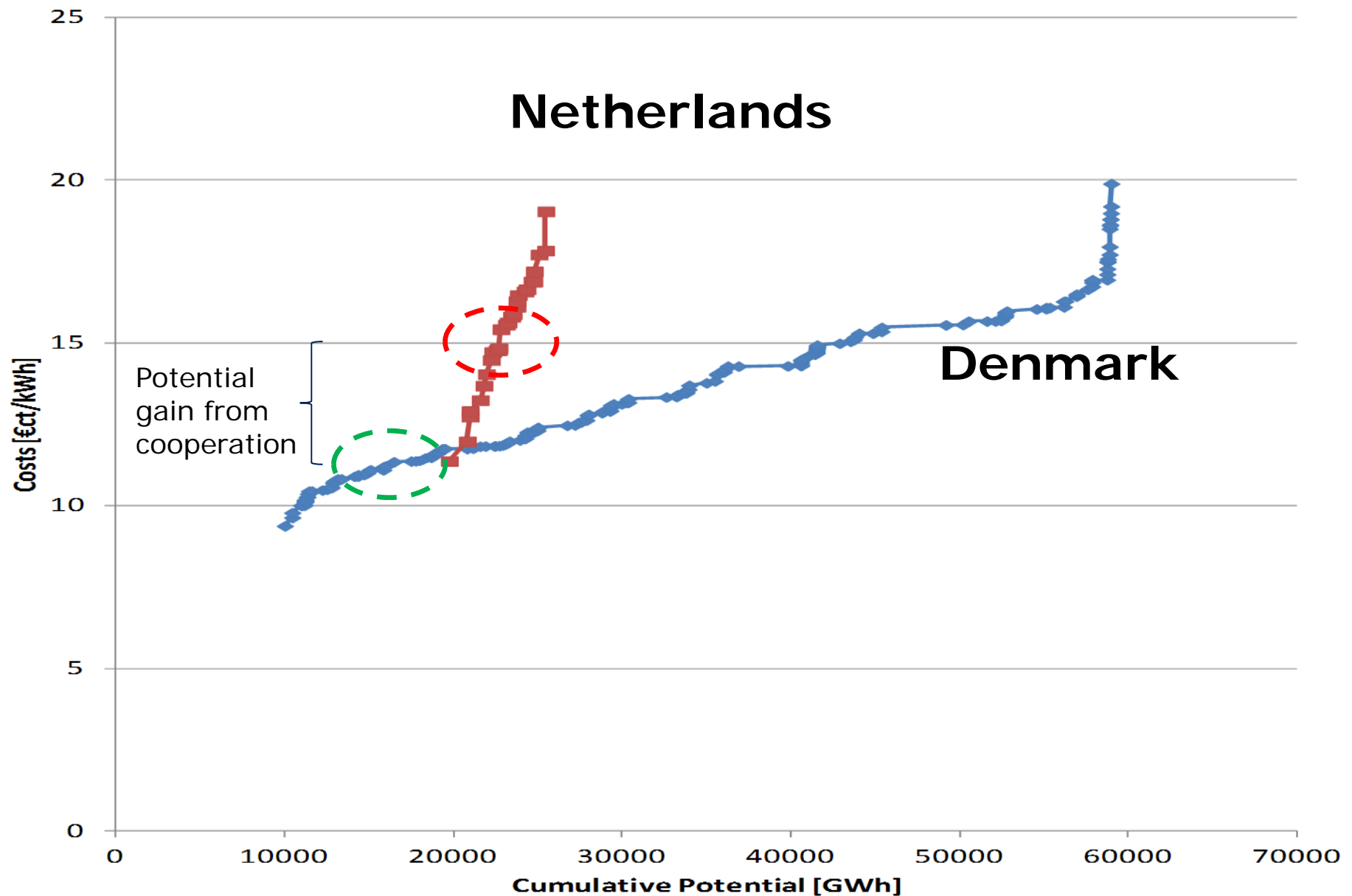
## WP2 Results points to considerable Valleys of Opportunities for off-shore wind

**Table: Main pairwise off-shore VoO's in 2020 sorted by size of host (TWh)**

Host\user	UK	Netherlands	Poland	Greece	Belgium
Denmark	30.8	19.7	13.0	11.2	6.0
Germany	15.7	13.6	9.2	9.2	3.5
Ireland	0?	7.0	6.7	8.1	4.4

The case study is focusing on 8.2 TWh out of the identified 19.7 TWh VoO between DK and The Netherlands

# Offshore wind costs 2020



# Joint project cooperation: Danish offshore wind of 2GW in the North Sea

2020 potential below 15 €/ct/kWh is available in Denmark

- Distance from shore: 20-25 km
- Depth: 20-25 m
- Windspeed: 10-11 m/s
- Close to support port (Esbjerg)

In the Horns Rev area and nearby there are considerable potentials for expanding capacity from the already existing 369 MW and the 400 MW addition decided



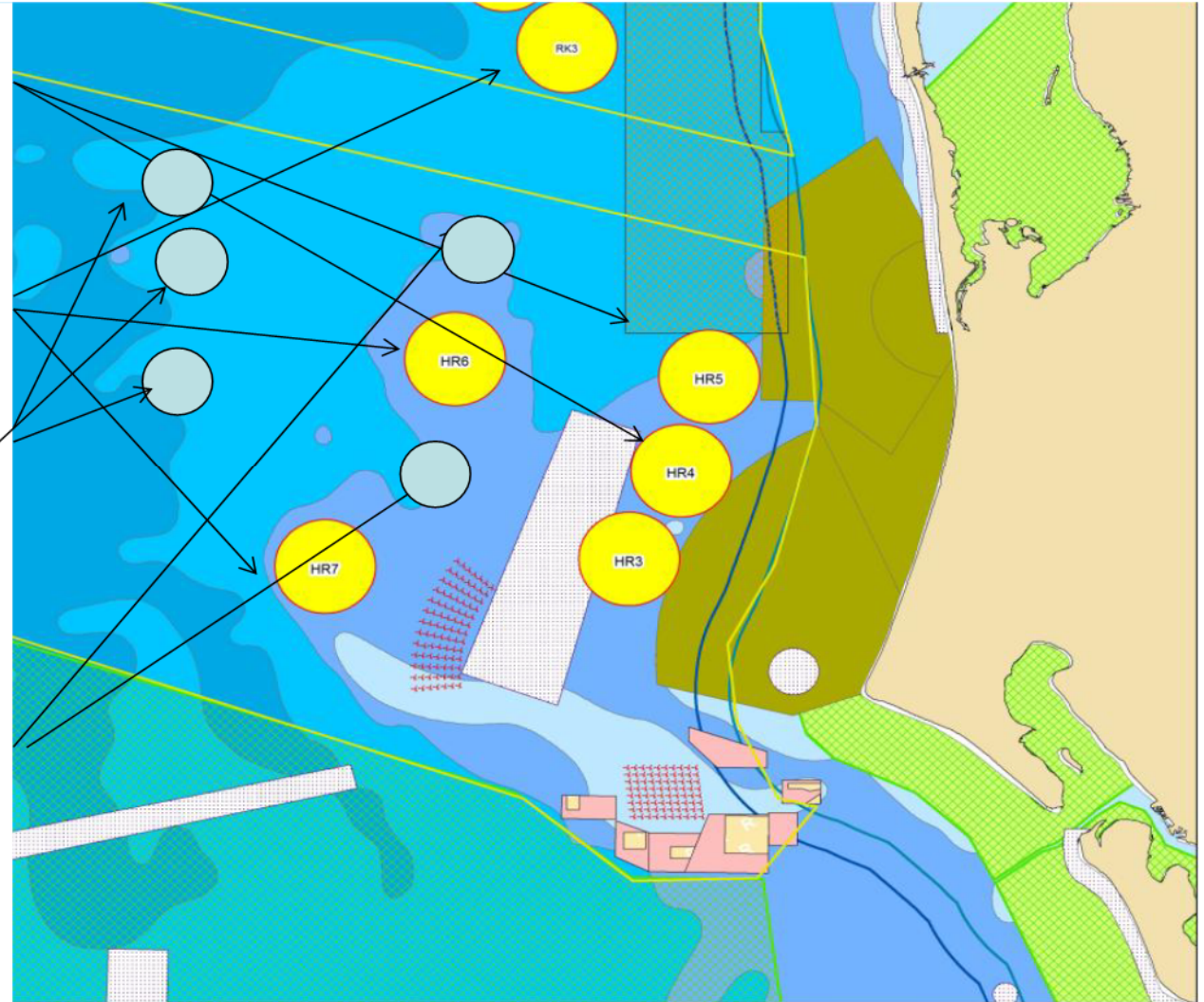
# Horns Rev planned wind farms and additional locations

Probably available

Planned and available

Additional deeper locations with higher costs

Additional options with minor compensation payment to other parks



## Suggested design of the cooperation mechanism:

Cooperation include two options for the **Netherlands**:

I. Acquire only the credits necessary for 2020 compliance: Cost example, **350 Euro/MWh in 2020**

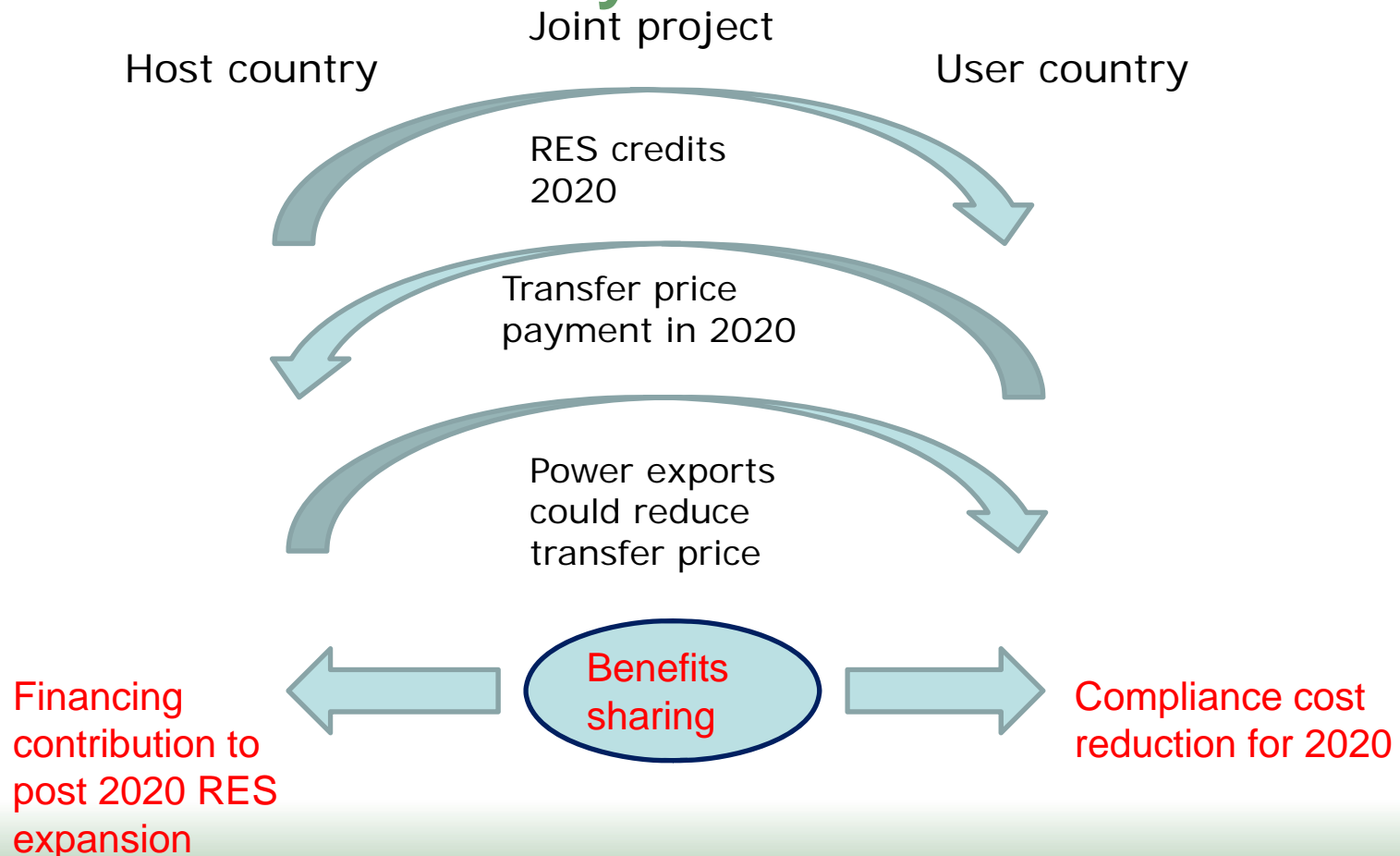
➡ **Full risk on post 2020 compliance**

II. Acquire the full RES capacity credits necessary for 2020 compliance but not the power generation: Cost example, support cost for 15 years: **80 Euro/MWh annually corresponding to 1200 Euro/MWh for 2020 credits**

➡ **Capacity counts towards NL post 2020 targets (reduced risk)**

# Transfer price and RES credits principles

## Host and user country transfer of 2020 credits



# Benefits for the Netherlands (preliminary illustration)

Total credits: <b>8200 GWh</b>	<b>Option 1 Credits price 35 c€ per KWh 2020 generation (physical transfer)</b>			<b>Option 2 Transfer of all <i>capacity</i> credits to NL (no physical transfer)</b>		
	Total costs of credits	Cost savings NL development support (10 c€) – 15 years	Net benefit 2020 (excluding post 2020 targets)	Total DK support costs financed by NL 8c€/kWh	Cost savings NL development support (10 c€) for 15 years	Net benefit 2020 (capacity available for post 2020 targets)
<b>Results</b>	<b>2870 mill €</b>	12300 mill €	<b>9430 mill €</b>	9840 mill €	12300 mill €	<b>2460 mill €</b>

# Case study off-shore wind (NL-DK) 2000MW

## Timeline example (Option I)

2012/13	2013	2013/14	2014	2014-16	2016	2017-19	2020	2020-32
Sites and conditions for tenders defined – negotiation on transfer price and volume	Negotiation phase concluded – tender material prepared	Tender for offshore wind parks of 1000MW	Contract with investor/- developer signed Signed DK-NL transfer agreement	Construction phase I	Construction finalised New tender for additional 1000MW New signed agreements	Construction phase II	Transfer of RES credits DK-NL settlement payments	Continued DK support payment to RES investor

## Preliminary conclusions: Danish offshore wind of 2GW in the North Sea

Danish off-shore wind development is available for cooperation and joint projects with tendering is relatively simple to establish

Benefits in terms of compliance cost savings for Netherlands can be substantial  
**2.5 bill € - 9.4 bill € depending on design option**

Denmark will have more wind development and in option 2 have additional credits to comply with increased post 2020 RES targets or domestic RES targets

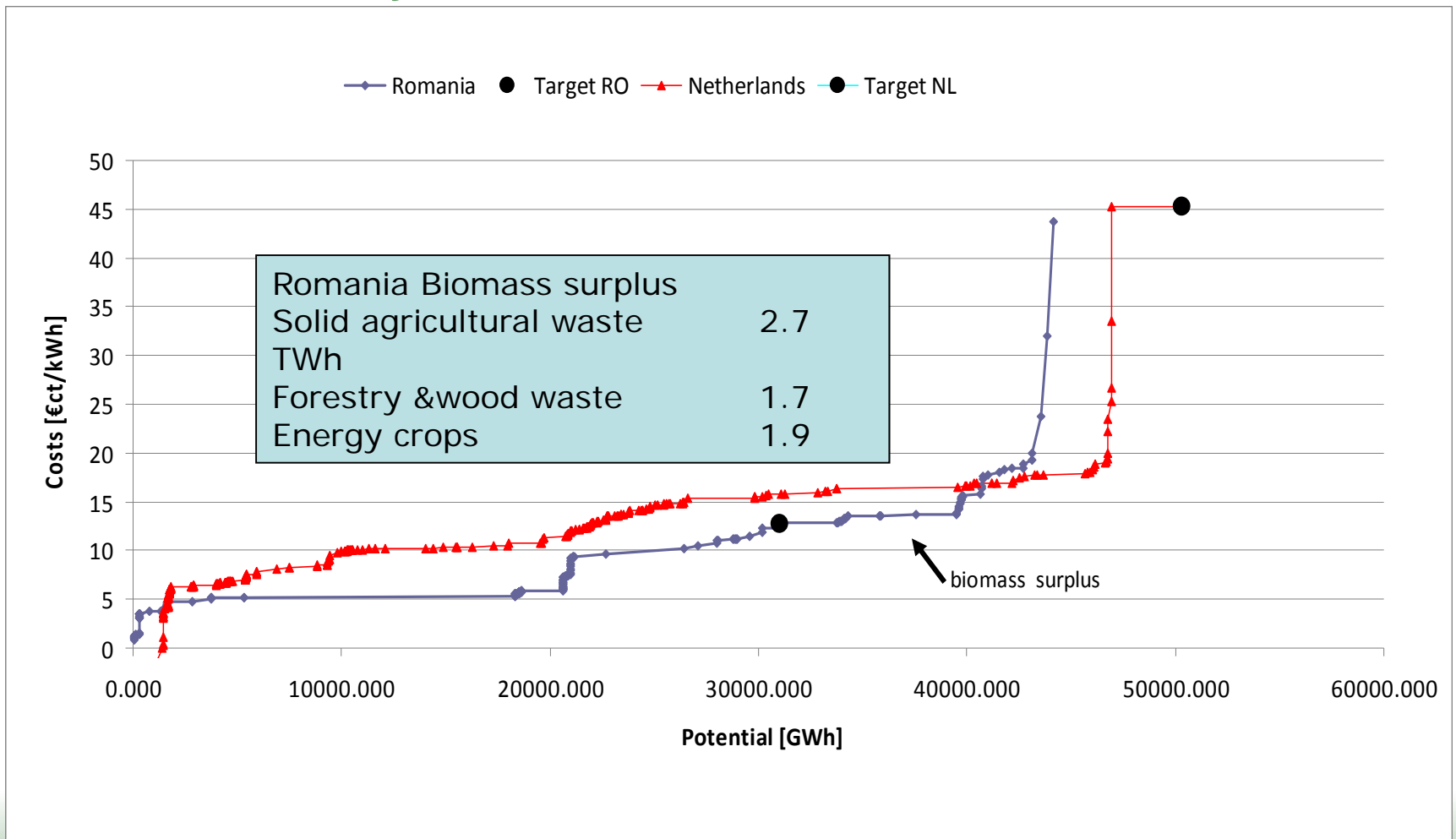
The results for both countries are extremely sensitive to the assumptions regarding the value of post 2020 credits (5c€/kWh) **EU post 2020 targets?**

The physical transfer option is included in option 1, but will be studied in more detail

Indirect effects have not yet been quantitatively accounted for

# Biomass energy – Case study of cooperation mechanisms design

## RES CSCs for Romania (Host country) and the User country, the Netherlands





## The market, the RES national support systems and the political approach create real conditions, different than the CSCs

Only part of this surplus is realistic to be offered by the Host country for a cooperation mechanism:

We choose in the case study to dimension to **2 TWh/year** the quantity to be agreed within a cooperation mechanism.

### Market conditions are favoring a biomass cooperation mechanism

- The RO target is on track to be fulfilled, with a plus on the expected contribution from wind and PV. Many wind and PV projects are on the pipe line, securing by PPA the selling of their output (Green Certificates) up to 2020.

Biomass projects are arriving with a "delay" on the market, and risk to find a low domestic demand for their GCs, therefore welcoming any other arrangement.

- After 2016 there is no national support scheme for new RES projects, therefore appears an "open" space for other programs/schemes to promote RES-E projects

## Technology choice and specifics

The biomass for power chains are **very diverse**

### **Selected biomass resources**

Not forestry resources: sensitive for public and politicians, but

- Agricultural waste
- Vegetal product from energy crops on unused land
- Animal waste

### **Technology**

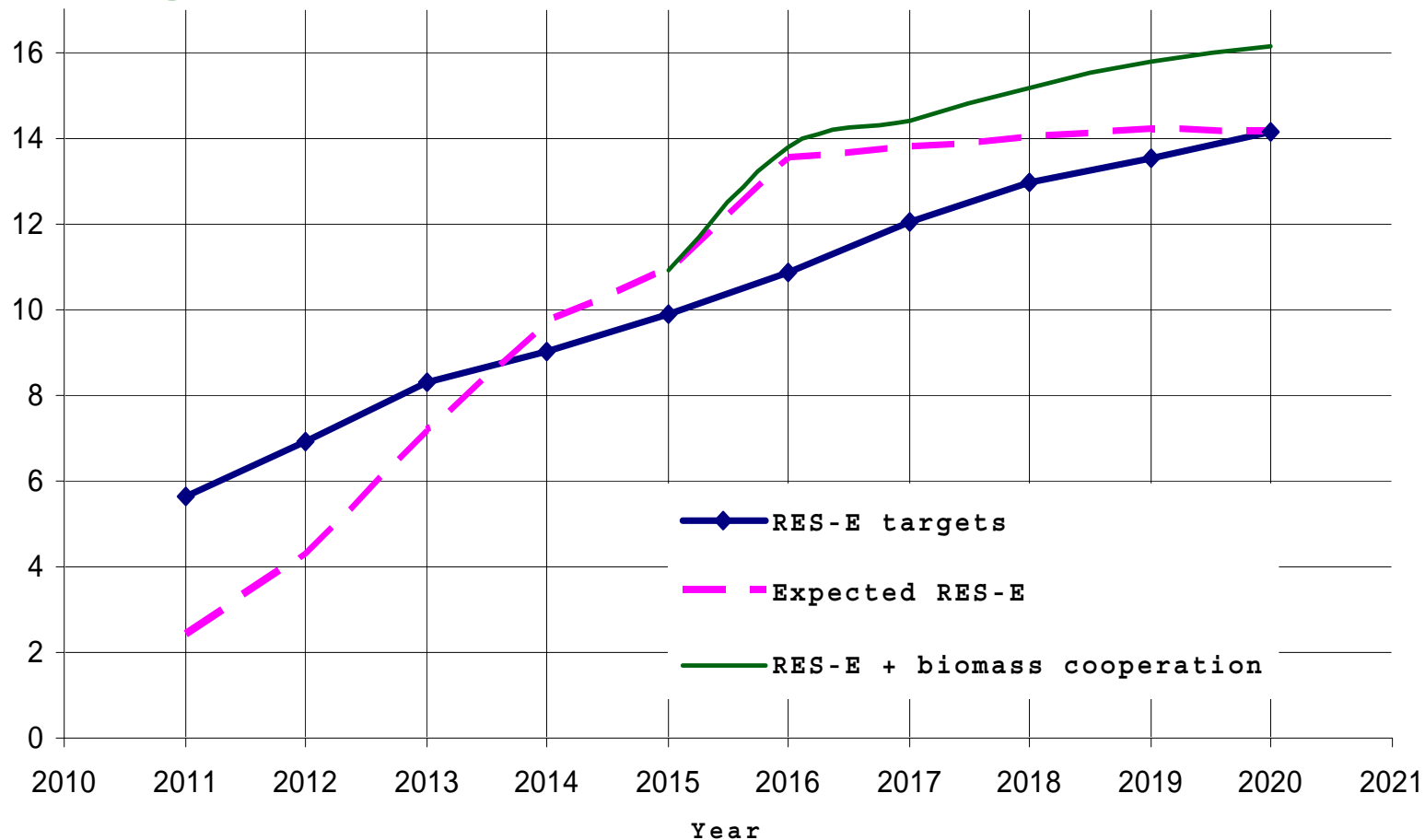
No specific restriction on technology, **if efficient**:

anaerobic digestion, gasification of woody material etc.

Biomass projects have usually a **small/medium size**, due to the cost of biomass collection, transport and management: 5...20 MW.

Therefore, already appears the challenge to put in place a mechanism able to manage **several projects totalling a significant output**, rather than a single joint project.

## Estimated evolution of RES-E production (without large hydro) versus the targets, with and without the biomass cooperation mechanism



## What kind of CM ?

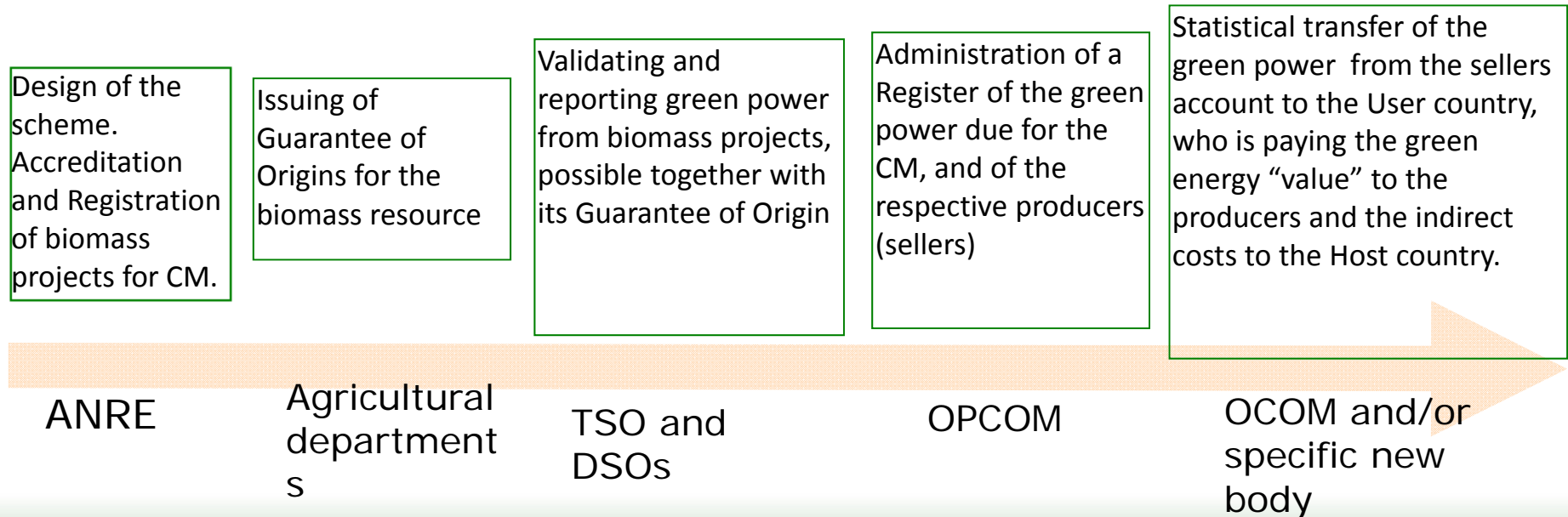
Joint projects: fitted more for large size projects

Joint support scheme: the support schemes are very different, there is no similar to Romania quota support scheme in potential user countries

Suggested variant:

**A special support framework in Romania for a number of small and medium size projects able to provide a defined quantity of energy, rated realistically to 2 TWh in the case study.** The green energy value is transferred (statistically) to and bought by the User country for at least 10 years from a project life.

The management of biomass projects registered in Romania for the cooperation mechanism and their output could be organized starting from the good experience on the Green Certificates procedures. A similar managing track with the same actors as for GCs (Regulatory body ANRE, Transport and Distribution System Operators, the Commercial Operator OPCOM) may be put in place for the cooperation mechanism.



# The price for the transferred power within a CM is negotiated

## **Costs to go to the projects operators as premium for the “green” energy.**

A reference to estimate these costs may be the incentives of biomass RES producers according to the national support schemes, in Romania and the User country as well (80.....160 Euro/MWh, depending on technology)

+

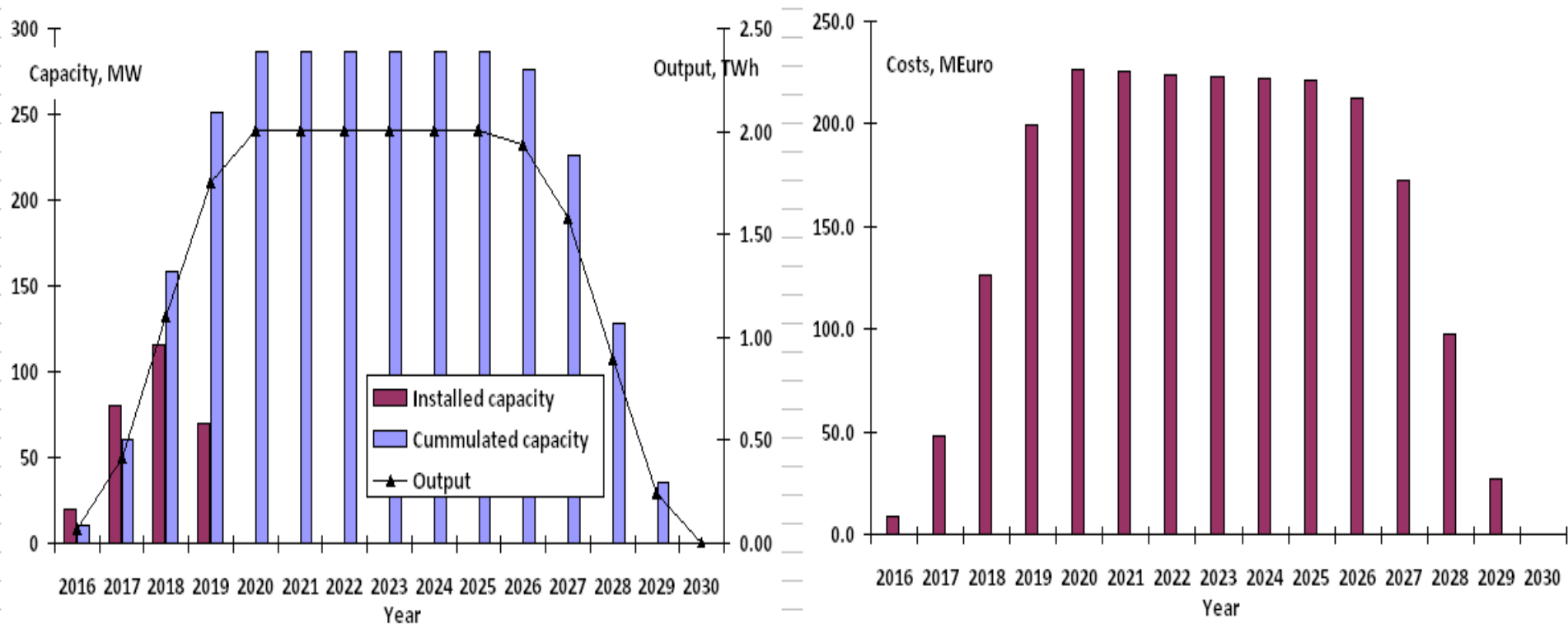
**Costs to go to the Host country to recover the net between indirect costs (environment, scheme management, sell-out of RES potential etc) and advantages (investments effect, cheap electricity, distributed generation into the grid etc)**

**The investments in the corresponding biomass projects, with an average capacity of 5-10 MW, total c.a. 1 billion Euro.**

**E.g. if the average CoE from the biomass projects is 150 Euro/MWh, the agreed transfer price may be 110...120 Euro/MWh, for at least 10 years of the project life.**

**The User country has to pay c.a. 2.28 billions Euro in 14 years, of which c.a. 0.62 bEuro until 2020.**

## A scenario for capacities and output of biomass projects within the CM scheme



## Conclusion

The present case study scheme has the advantages of **flexibility and possible step by step development**, a pragmatic approach agreed usually by the User, starting with lower targets, and adjusting its main parameters (target, the price of the green electricity, period) following the real market feed backs and policy needs.



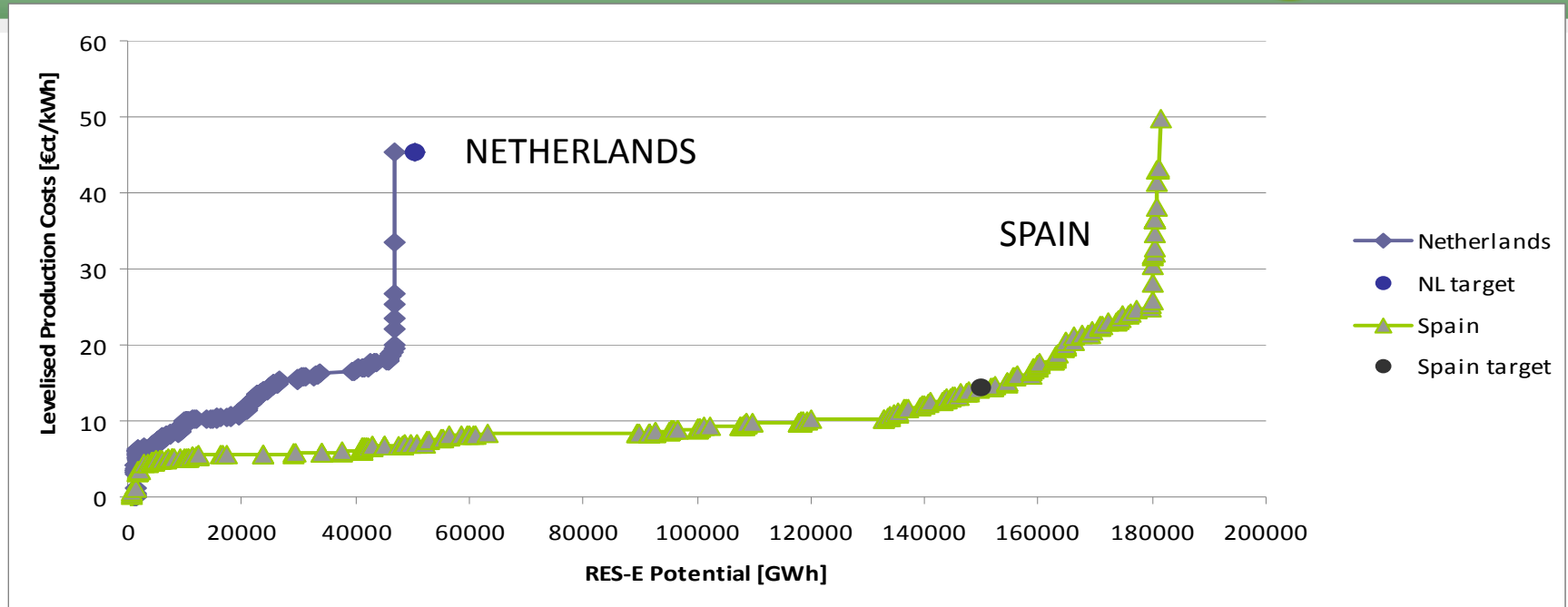


# SOLAR CASE STUDY OF COOPERATION MECHANISMS

Natàlia Caldés and Marta Santamaría  
CIEMAT

IEE Project Res4less [www.res4less](http://www.res4less)  
Brussels, June 22st 2012

# BACKGROUND (WP2 results)

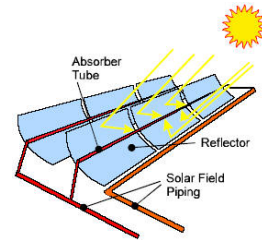


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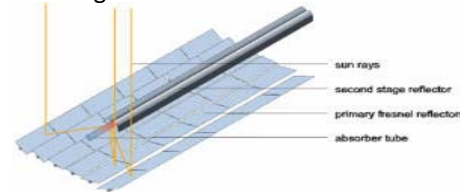
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# THE TECHNOLOGY: Concentrated Solar Power

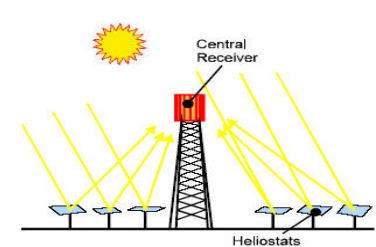
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Parabolic trough



Fresnel



Central Receiver (tower)

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Fresnel

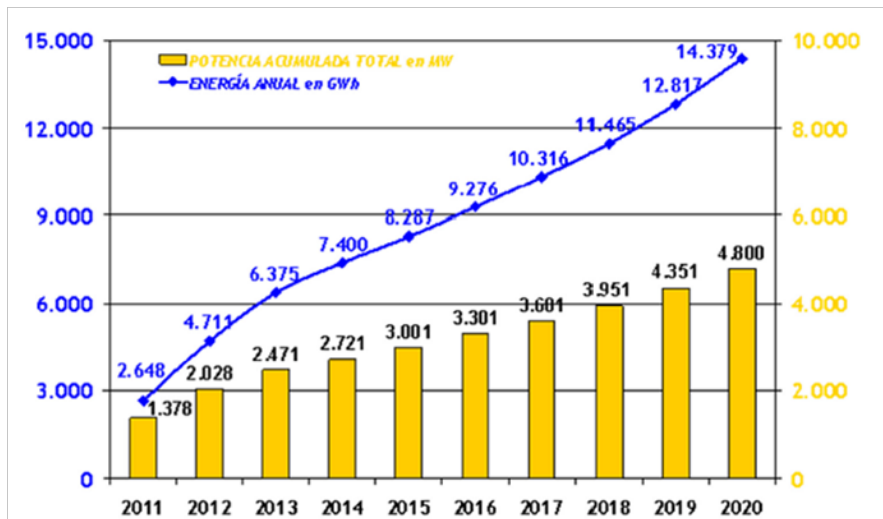
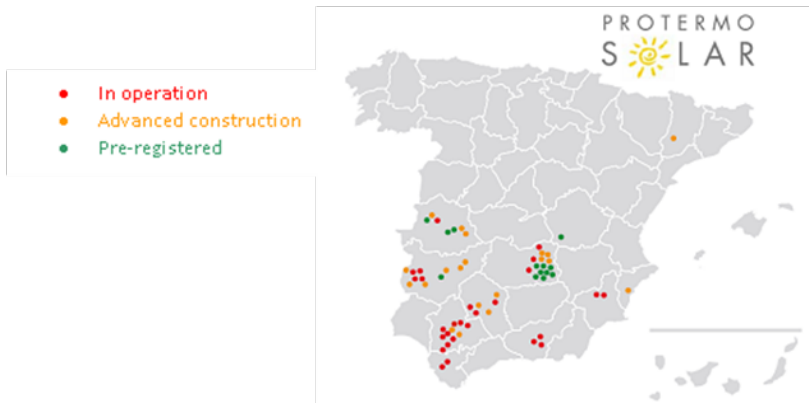


Central receiver



Stirling dish

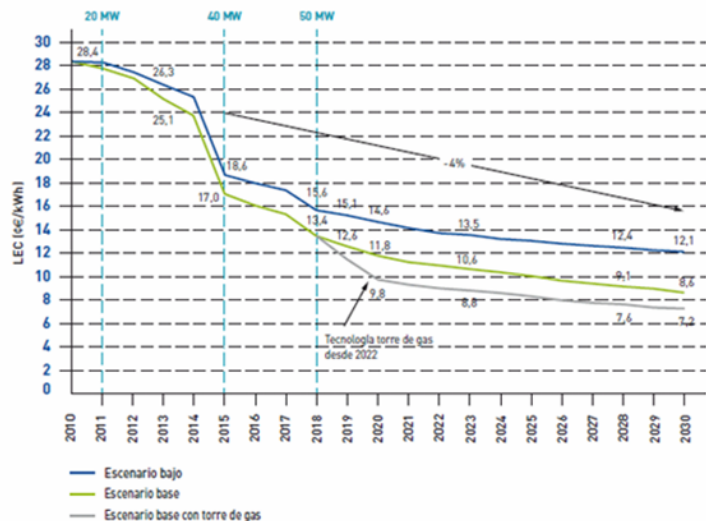
Pictures: Protermosolar



## KEY SUCCESS FACTORS FOR CSP DEPLOYMENT IN SPAIN

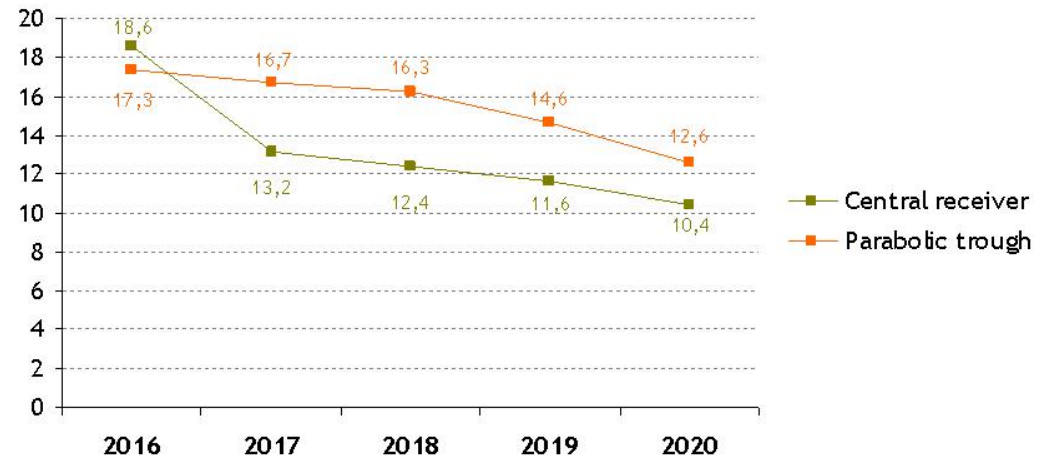
- Enough **solar resource**
- **Suitable planning** – The Spanish Government has identified the barriers and proposed measures to overcome them and achieve the deployment objectives.
- **Legal framework**: has allowed economic viability and grid access guarantee
- **R&D** activities have taken place in Spain since the 80 s
- Mature **industrial sector** with capacity to develop the technology and invest great amounts (12,000 to 15,000 Million €)

# CSP GENERATION COST EVOLUTION

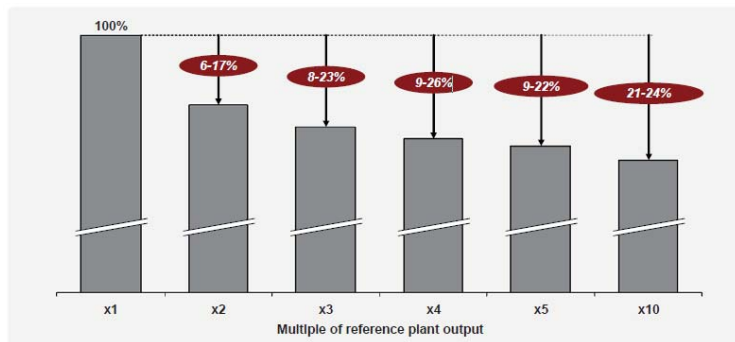


Source: Boston Consulting Group (2011)

CSP cost curve [c€/kWh]



Source: Own elaboration, on the base of BCG (2011) and ATKerney (2011)



Notes: Percentages equal percentage reduction of capital expenditures and GWh annual output. Plant scaling refers to plant sizes from 50-500MW; 15MW Linear Fresnel plant has been excluded from overview; solar tower only scaled up from 30-200MW; Linear Fresnel from 15-250MW. Sources: Interviews with industry experts; A.T. Kearney analysis

Source: ATKerney (2011)



Ouarzazate CSP plant (Morocco)

22 June 2012

EU Sustainable Energy Week,  
Brussels

# PROPOSED CASE STUDY

Parameter	Value
Type of cooperation mechanism	Joint project
Host country	Spain
User country	Netherlands
Physical Transfer	No
Size of the VoO	1st phase: 2,5 TWh 2nd phase: 2,5 TWh



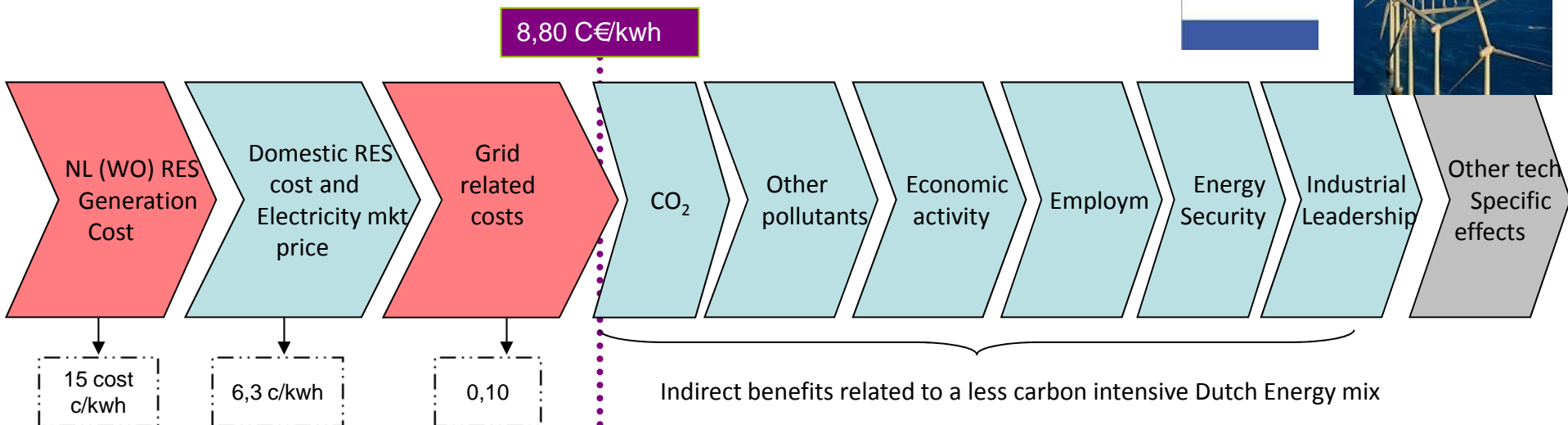
## Possible implementation scheme to generate 5 ThW

MW	2014	2015	2016	2017	2018	2019	2020
CCP en construcción	200	400	400-625	200-425	225	0	0
Torre en construcción	200	400	400-625	200-425	225	0	0
CCP en operación	0	0	200	400	625	625	625
Torre en operación	0	0	200	400	625	625	625

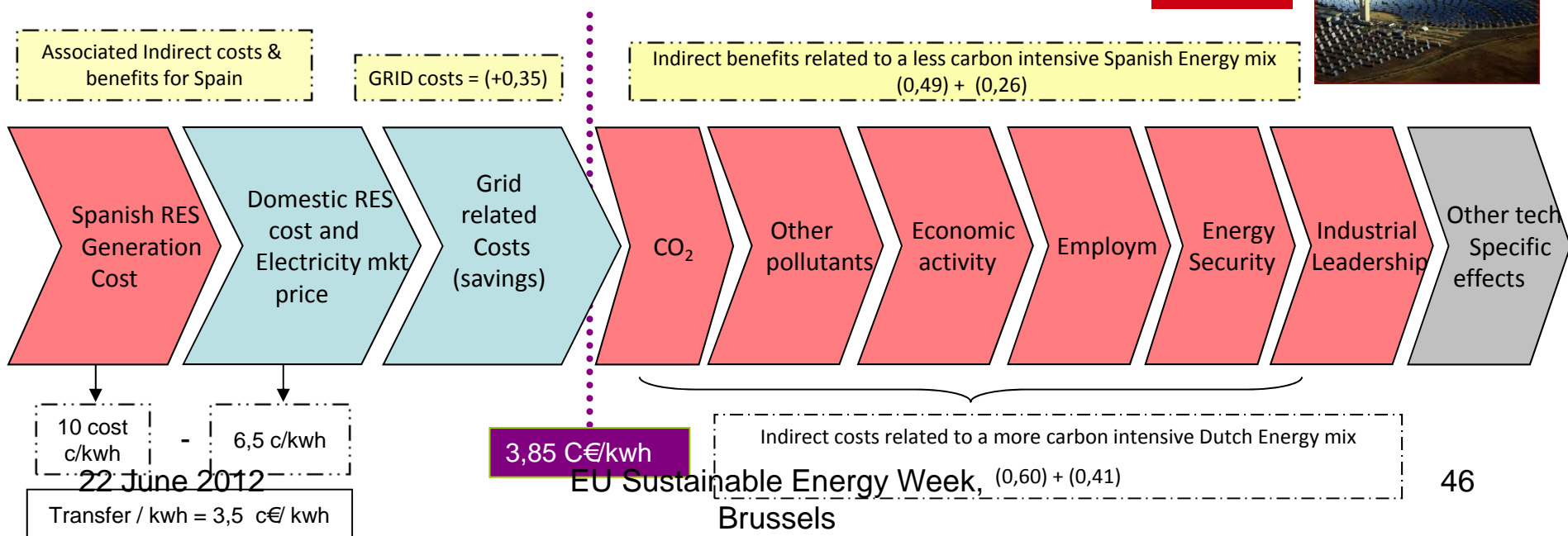
Parameter	Value
Technology	CSP (central receiver – Tower) CSP (parabolic trough)
Construction time	2 years
Capacity of the Plants	200 MW (*)
Generation costs (2020)	10 c€/kwh
Location	Southern Spain (to be further detailed based on an existing registre application)
Load factor	4.000 (45%)
Storage capacity	9 hours
Hybridization	Possibility to use Natural Gas or Biomass up to 15% (*) (*) Total generation taking into account hybridization 5,75 TwH
Production	1200 MW installed capacity - 5 Twh
Number of plants	6 plants (2 200 MW plants and 1 225 MW)
Cooperation mechanism	Joint project without physical transfer
Displaced technology in the Spanish Energy mix	Natural Gas Combined Cycle



## BASE CASE SCENARIO (NL PRODUCES WIND OFFSHORE ELECTRICITY DOMESTICALLY)



## COOPERATION SCENARIO (NL "BUYS" CSP ELECTRICITY FROM IN SPAIN)





Ranking	Type of barrier
1	Cost reduction
2	Institutional set-up
3	Uncertainty about post 2020
4	Grid capacity limitations
5	Payment scheme
6	Coordination with the existing National Regulatory scheme
7	Grid interconnection capacity limitation
8	Risk of non-compliance
9	Identification, quantification and monetization of those indirect costs and benefits
10	Oposition from those sectors that will be negatively affected
11	Social acceptability
12	Spanish Economic Situation



Real cooperation opportunities exist for CSP

Only materialize if projected cost reductions are met

Grid implications have to be taken into account

Good opportunity for indirect benefits for Spain and the CSP sector

Thank you for your attention